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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/538,407

06/10/2005

Robert Dwilinski

0047/028001

1785

22893

7590

04/02/2007

SMITH PATENT OFFICE

1901 PENNSYLVANIA AVENUE N W

SUITE 901

WASHINGTON, DC 20006

EXAMINER

MALEKZADEH, SEYED MASOUD

ART UNIT

PAPER NUMBER

1722

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

04/02/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/538,407

Applicant(s)

DWILINSKI ET AL.

Examiner

SEYED MASOUD
MALEKZADEH

Art Unit

1722

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06/10/2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13, 22 and 23 is/are pending in the application.
- 4a) Of the above claim(s) 1-13 and 22-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13, 22 and 23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 10/03/2005
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

An initialed and dated copy of Applicant's IDS form 1449 filed 10/03/2005, is attached to the instant Office action.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The word "the" in the third line of claim 11 is repeated two times, which is redundant and make the claim unclear and indefinite. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-2 and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski et al (US 7,132,730) in view of Anselm et al. (US 6,265,322).

Dwilinski et al ('730) teaches a substrate used for opto-electric or electrical devices which comprises a layer of nitride grown by means of vapor phase epitaxy growth (See abstract and lines 54-58, column 4) which the dislocation density of the substrate is $5 \times 10^5 / \text{cm}^2$ or less, wherein the substrate has a thickness of 1 μm or more (See abstract). The layer of bulk mono-crystal nitride contains at least one element of alkali metals. (See lines 32-44, column 6).

Dwilinski et al ('730) also teaches the layer of Gallium nitride is grown by means of MOCVD or HVPE process. (See lines 54-58, column 4)

Dwilinski et al ('730) further teaches the diameter of the substrate is about 2-inch. (See lines 41-43, column 24)

However, Dwilinski et al ('730) does not teach both main surfaces of the nitride substrate are consisting of non N-polar face and N-polar face.

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In the analogous art, Anselm et al ('322) teaches a GaN layer grown on a substrate wherein both main surfaces of the nitride substrate are consisting of non N-polar face and N-polar face. (See lines 18-32, column 2 and lines 46-53, column 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Dwilinski et al ('730) by specifying both main surfaces of the nitride substrate are consisting of N-polar face and non N-polar face in order to determine the vertical growth direction of crystalline nitride layers over the substrate, as suggested by Anselm et al (US 6,265,322)

Claims 3-7, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski et al. (US 2004/0238810) in view of Anselm et al. (US 6,265,322)

Dwilinski et al ('810) teaches a process of preparing a substrate which comprises steps of preparing a layer of bulk mono-crystal nitride containing at least one element of alkali metals to have a thickness for substrate by crystallization of gallium or aluminum-containing solution on a seed from a supercritical ammonia-containing solution. Also, forming a layer of nitride by means of vapor phase epitaxy growth on polar face of the layer (See lines 29-33, column 4) and slicing the layer off from the substrate to get a substrate having a thickness of 100 μm or more. (See paragraph [0012], [0014], and [0015]).

Furthermore, Dwilinski et al ('810) also teaches a GaN formed by a vapor phase growth, such as HVPE method or MOCVD method. (See paragraph [0041])

Also, Dwilinski et al ('810) further discloses the step of annealing the substrate in the atmosphere that does not contain hydrogen at a temperature 700°C.

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Further, Dwilinski et al ('810) teaches the end face layer of the substrate has a thickness of $1\mu\text{m}$ or less. (See paragraph [0010]).

Moreover, Dwilinski et al ('810) teaches the step of annealing is carried out in a single step or in multiple steps until the desired level of impurities is reached. (See paragraphs [0027], [0061], and [0034])

However, Dwilinski et al ('810) does not teach the main surface of mono-crystal nitride substrate consist of Ga polar face.

In the analogous art, Anselm et al (US 6,265,322) teaches a selective growth technique for group III-nitride materials which a GaN layer grown on a substrate wherein the main surfaces of the Gallium nitride substrate are consisting of Ga polar face (See lines 18-32, column 2 and lines 46-53, column 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Dwilinski et al ('810) by specifying GaN on a Ga-polar surface in order to control the growth direction of nitride layer over the substrate, as suggested by Anselm et al (US 6,265,322)

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski et al ('810) and Anselm et al. ('322) as applied to claims 3-7, 9 and 11 and further in view of Hong et al. (US 6,177,292)

Dwilinski et al ('810) and Anselm et al ('322) teach all the limitations of process for preparing a substrate for opto-electric or electrical devices. However, Dwilinski et al ('810) and Anselm et al. ('322) do not teach polishing the surface of the substrate.

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In the analogous art, Hong et al (US 6,177,292) teaches a method of forming a single crystal GaN semiconductor substrate which the surface of the substrate is subjected to a polishing process. (See abstract and lines 1-20, column 5)

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the method of Dwilinski et al ('810) and Anselm et al ('322) by including a step of polishing the surface of substrate in order to remove defective top layer of substrate which contains oxides and cracks, as suggested by Anselm et al ('322).

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski et al ('810) and Anselm et al. ('322) as applied to claims 3-7, 9 and 11 and further in view of Tsutsui et al (US 6,248,607).

Dwilinski et al ('810) and Anselm et al ('322) teach all the limitations of process for preparing a substrate for opto-electric or electrical devices. However, Dwilinski et al ('810) and Anselm et al. ('322) do not teach the step of performing annealing process in an atmosphere of inert gas with an addition of oxygen between 10 and 30 Vol.%.

In the analogous art, Tsutsui et al (US 6,248,607) teach a method for manufacturing semiconductor light emitting device, which the step of annealing of GaN substrate is carried out in an atmosphere of inert gas with an addition of oxygen between 10 and 30 vol.%. (See lines 14-38, column 2)

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the method of Dwilinski et al ('810) and Anselm et al ('322) by carrying the step of annealing in the atmosphere of inert gas with an addition

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of oxygen between 10 and 30 vol.%. in order to activate the GaN growth layer of substrate in a shorter time, as suggested by Tsutsui et al ('607).

Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski et al ('810) and Anselm et al. ('322) as applied to claims 3-7, 9 and 11 and further in view of Otsuka et al. (US 6,749,819)

Dwilinski et al ('810) and Anselm et al ('322) teach all the limitations of process for preparing a substrate for opto-electric or electrical devices. However, Dwilinski et al ('810) and Anselm et al. ('322) do not teach step of removing impurities from bulk mono-crystalline nitride by a process of rinsing in the environment of supercritical ammonia containing solvent, water or carbon dioxide or being subjected to the action of gaseous hydrogen, nitrogen or ammonia.

In the analogous art, Otsuka et al. ('819) teaches a process for purifying ammonia by removing impurities from bulk mono-crystalline nitride through a process of rinsing in the environment of supercritical ammonia containing solvent or carbon dioxide (See lines 60-68 column 3, lines 1-65 column 4, and lines 43-67 column 17).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the method of Dwilinski et al ('810) and Anselm et al ('322) by including a step of removing impurities from bulk mono-crystalline nitride in order to improve the quality of mono-crystalline nitride layer by eliminating impurities such as oxygen from ammonia, as suggested by Otsuka et al. ('819).

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Remarks

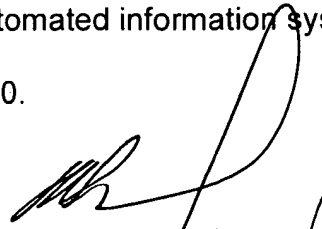
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Seyed Masoud Malekzadeh whose telephone number is 571-272-6215. The examiner can normally be reached on Monday – Friday at 8:30 am – 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra N. Gupta can be reached on (571) 272-1316. The fax number for the organization where this application or proceeding is assigned is 571-272-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SMM


Prabhat Kureemund
Primary Examiner
7C1700